



## Design Considerations – Hard Anodising

This engineering guide is an introduction to design considerations. We offer friendly technical advice and free samples, so please contact us for more detailed advice.

General design considerations include:

- The application of the component
- Aluminium or Titanium alloy to be used
- Corrosion and hardness requirements
- Thickness range of film
- Final dimensional tolerances
- Optimum location for contact points
- Any approval or specification requirements

Also, we can assist with:

- Pre-treatment (finishes to the surface to be anodised)
- Type of anodising or conversion coating
- Post-treatment (such as sealing)
- Key properties required
- Masking
- Jigging

Hard Anodising differs from conventional anodising in that the resulting coating is considerably denser. At the design stage, a host of variables must be manipulated to produce the desired results.

### **1.0 Metal specification**

Aluminium and most aluminium alloys have a high corrosion resistance due to the natural protective oxide film that forms immediately the metal is exposed to air. Under controlled conditions the thickness, hardness, electrical, and due to its microcellular structure, the dye absorption properties can be selected for specific applications.

Please see our companion document “Technical Information”.

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# ALUMINIUM SURFACE ENGINEERING

Generally, denser and harder coatings are created on high-purity or commercially pure aluminium alloys, while less-dense and softer coatings are produced on heat-treated alloys containing higher quantities of alloying elements. The difference is that some alloy constituents may not dissolve during the anodic process, causing microscopic voids. These voids decrease coating density and lower resistance to abrasion and corrosion.

Experience has shown that best results are obtained on alloys with low copper and silicon content.

It is important that the metal specification is considered for its anodising suitability as early as possible, especially if a specific property is required.

## **2.0 Surface finish**

The surface finish may be impaired by Hard Anodising, therefore a superior finish to that required is necessary.

The smoother the surface finish obtained prior to any anodising process the better the corrosion resistance will be in service and less effect there will be on the loss of fatigue strength.

All edges of components submitted for Hard Anodising should be given a radius to avoid chipping and excess cracking of the coating. The minimum recommended is 0.75mm.

## **3.0 Fatigue strength and stresses**

Hard Anodising will reduce fatigue strength considerably, and can be as much as 50%. This can largely be restored by sealing, but this also will slightly reduce the abrasion resistance. Di-Chromate, Nituff® and Sulphuric Anodising will improve fatigue strength.

## **4.0 Assemblies**

Assemblies of parts made from aluminium should be avoided wherever possible, and if treated Chromic Anodising is recommended.

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If the assembly contains various alloys of aluminium then problems will occur in obtaining the correct anodising conditions, as each alloy will require different operating conditions. Any other metals included cannot be anodised unless they are stopped off, but no guarantee can be given for damage that might occur if these do contact the anodising solution. As an alternative, an Alocrom treatment could be considered for assemblies or parts with mixed metals (see our Technical Sheet on Alocrom 1200).

### **5.0 Forming**

If a pressure or forming operation is required after anodising then a thin film process should be selected, usually Chromic Anodising has practical advantages for such a requirement.

The use of rounded tools is necessary to form anodised aluminium without producing visible crazing.

### **6.0 Preparation of parts to be anodised**

Parts should be clean, metallurgically sound, and as free as possible from surface defects, scratches, pits, torn metal and other faults. Surface defects will coat, but they will not fill in.

Heavy mill scale and other gross contamination should be removed by the processor. The processor also can advise on the minimisation of other contaminants such as drawing lubricants, machining coolants or other soils introduced during fabrication.

Inserts, dowels and helicoils should be omitted or removed before processing.

Components with riveted joints are generally not suitable for Hard Anodising due to potential entrapment of corrosive electrolytic solution, damaging the component.

Prints or instructions should be sent with an order, indicating the areas to be masked, as well as non-critical areas where an electrical contact or fixturing marks are possible.

We are happy to work with you, and provide free samples to ensure optimal and cost-effective results.

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## **7.0 Recommended sources of guidance**

### **BS EN ISO 7599:2010 Anodizing of aluminium and its alloys. General specifications for anodic oxidation coatings on aluminium.**

BS EN ISO 7599 lays down a method for specifying decorative and protective anodic oxidation coatings on aluminium (including aluminium-based alloys).

It defines the characteristic properties of anodic oxidation coatings, lists methods of test for checking the characteristic properties, provides minimum performance requirements, and gives information on the grades of aluminium suitable for anodising and the importance of pre-treatment to ensure the required appearance or texture of the finished work.

BS EN ISO 7599 does not apply to:

- Non-porous oxidation coatings of the barrier layer type
- Oxidation coatings produced by chromic acid or phosphoric acid anodising
- Oxidation coatings intended merely to prepare the substrate for subsequent application of organic coatings or electrodeposition of metals
- Hard anodic oxidation coatings used mainly for engineering purposes, for which abrasion and wear resistance are the primary characteristics (for these, refer to BS ISO 10074, below).

BS EN ISO 7599 includes:

- Terms and definitions
- Tests
- Coating thickness
- Quality of sealing
- Appearance and colour
- Corrosion resistance
- Abrasion resistance
- Resistance to cracking by deformation
- Fastness to light and ultraviolet radiation
- Light reflection properties
- Electrical breakdown potential
- Continuity of coating
- Mass per unit area (surface density) of coating
- Guide to grades of aluminium for anodising
- Guidance on surface preparation
- Interpretation of average and local thickness requirements

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- Standard test panels for calibrating test apparatus for measuring the thickness of anodic oxidation coatings on aluminium
- Guidance on cleaning materials for external architectural applications
- Summary of information to be supplied by the customer to the anodiser

## **BS ISO 10074:2010 Anodizing of aluminium and its alloys. Specification for hard anodic oxidation coatings on aluminium and its alloys**

BS ISO 10074:2010 is the key document regarding Hard Anodising.

**For friendly advice and free samples please contact us**

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